DOCUMENT RESUME

ED 212 998 CS 006 520

AUTHOR Raphael, Taffy E.; Wonnacott, Clydie A.
TITLE The Effect of Response and Type of Posttest on Understanding of and Memory for Text.
PUB DATE Dec 81
NOTE 22p.; Paper presented at the Annual Meeting of the National Reading Conference (31st, Dallas, TX, December 2-5, 1981). For related documents see CS 006 521.

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cognitive Processes; Elementary Education; Grade 4; Grade 8; Memory; *Questioning Techniques; *Reading Comprehension; *Reading Research; Recall (Psychology); *Retention (Psychology); *Test Format
IDENTIFIERS Adjunct Questions; *Prose Learning; Text Structure

ABSTRACT

A study examined whether (1) the performance of students on text explicit (TE), text implicit (TI), and script implicit (SI) questions inserted in a text would vary as a function of the type of question received; (2) students responding in writing to the inserted questions would perform at a higher level on a subsequent criterion test than those responding covertly or mentally; (3) student performance levels would be higher on a multiple choice recognition test than on a short answer recall one; and (4) patterns of student performance would remain constant across developmental levels. Subjects were 97 fourth grade and 102 eighth grade students who read a 600-word passage, responded to questions in either the TE, TI, or SI condition, and completed a reading comprehension posttest. Students in the overt condition were asked to write their responses to the inserted questions, while those in the covert condition were told only to think carefully about their responses. The reading comprehension posttest questions were prepared in either a short answer or a multiple choice format. Results showed no interaction between inserted question and test question type, and eighth grade students performed better in the overt condition than did fourth grade students. In addition, it was found that student performance was higher on recognition than on recall tasks and that performance patterns did not remain constant across developmental levels. (FL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

ED212998

The Effect of Response and Type of Posttest on Understanding of and Memory For Text

Taffy E. Raphael and Clydie A. Wonnacott

University of Utah

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Taffy E. Raphael
Clydie A. Wonnacott
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Paper presented at the National Reading Conference, Dallas, Texas, December, 1981. We would like to thank Jean McKinney for her analysis of the data, Diane Hermansen and Linda Magleby for their assistance in preparing and administering the materials, and Ralph Reynolds and Don Kauchak for their support throughout the project. In addition, we wish to thank the teachers and students at Butler Elementary and Butler Middle Schools for their participation in the study.

CS006520

The Effect of Response and Type of Posttest on Understanding of and Memory for Text

Rothkopf noted that while one can lead a horse to water, the only water that gets into its stomach is what it drinks; reminding researchers of the importance of investigating "drinking behaviors," i.e., what students do in learning situations (Rothkopf, 1970). Indeed, it seems apparent that the focus within the adjunct question paradigm has shifted from studies having a "variables" orientation to research having a "processing" orientation (Rickards & Denner, 1978). While earlier studies have examined the effects of manipulating question position and frequency on text comprehension, current research tends to focus on processing induced by adjunct questions. Thus, there is now more interest in the influence of adjunct questions on the encoding, organization and retrieval of text information.

Two factors that may influence these processes are: (1) the types of questions inserted in text and (2) the type of response required for answering these questions. A third factor that may influence the retrieval of text information is the test response mode. The purpose of this study is to examine the influence of these three factors on prose learning. Recent studies have suggested that question type may be as influential on prose learning as question position (Carrier & Fautsch-Patridge, 1981). However, an obvious problem with the research examining different kinds of questions has been that of definitions and categories. Generally researchers have supposed that certain questions require more work or deeper processing than others and have selected questions that vary in level or degree of required cognitive activity (Frase, 1969, 1970, 1971; Friedman & Rickards, 1981; Mayer, 1975;

McConkie, Rayner, & Wilson, 1973; Rickards, 1974; Rickards & DiVesta, 1974; Watts & Anderson, 1971).

For example, factual questions have been compared with inferential questions (Frase, 1971); knowledge questions with comprehension questions (Sanders, 1973); lower order questions with higher order questions (Shavelson, Berliner, Ravitch, & Loeding, 1974), and verbatim questions with comprehension questions (Felker & Dapra, 1975), to cite just a few. The diversity of questions used makes interstudy comparisons difficult and provides little generalizable information (Carrier & Fautsch-Patridge, 1981). What is needed is a taxonomy of questions that addresses the notion of question levels and is able to predict their effects on processing. The lack of such a taxonomy is a major obstacle to adjunct question research. A similar problem is also encountered within the levels of processing research wherein a taxonomy of orienting tasks is needed. In both instances, the difficulty rests in the fact that we are unable to observe what occurs in the head of the learners and thus are unable to quantify such reader variables as organization, breadth of background knowledge, question-answering skills, motivation, and the like.

In addition to defining levels of questions, a taxonomy of questions should accomodate the complex three-way interaction among the question, the text to which it refers, and the knowledge base of the reader. We have moved closer to that goal with the introduction of a taxonomy of questions by Pearson and Johnson (1978) which identifies questions on the basis of this three-way relationship. Their three category taxonomy includes text explicit (TE), text implicit (TI), and script implicit (SI) questions.

In a TE question-answer relationship (QAR), the constituents used to create the question and those used to respond appropriately are located within a single sentence of a text (e.g., Mary wore a scarf to school. Who wore a scarf to school? Mary). In a TI QAR the constituents used to form the question and those used to respond appropriately are both located in the text, but require the integration of information across sentences, paragraphs, or pages. In an SI QAR the question is text-based but the appropriate response information is a part of the reader's knowledge base; the text does not provide adequate information for the response. While this taxonomy does not describe level or depth of processing involved, it is successful in depicting the relationship between the question and the answer; or more specifically, the information used to create a question and the appropriate source of response information. This is a step forward in attempting to investigate prose processes.

A second factor, inserted question response mode and its effect on text recall has not been investigated systematically with children. Typically students have been asked to respond in a variety of ways--underlining relevant passage information (e.g., Rickards & Denner, 1979; Frase, 1968), providing short answers to open ended questions (e.g., Anderson & Myro, 1971); and selecting a response from a set of alternatives (e.g., Frase, 1968). It has generally been demonstrated that the inserted question effect upon text retention is greater when the reader is required to supply the answer. Effects are stronger, for example, with short-answer inserted questions than with multiple-choice inserted questions (Anderson & Biddle, 1975). What is not yet known is the response mode most facilitative for children's comprehension. Adult

performance is most improved when the inserted question requires an overt response as opposed to a covert or mental reponse (Anderson, 1967; Anderson & Biddle, 1975; Holland & Kemp, 1965; Kemp & Holland, 1966). One might infer that the same would be true of children, but given the inconclusive results of the effect of adjunct questions with children (e.g., Rickards & Denner, 1979; Rickards & Hatcher, 1978), this remains to be demonstrated.

A third factor, the type of criterion test needs to be examined in terms of children's comprehension. Tests have generally been either short answer or multiple choice in format, but there have been no studies with children comparing performance following inserted questions across the two types of examinations. It would seem that certain modes of responding place greater demands on memory than others, with the probability that recognition (multiple choice) formats are less demanding than recall (essay or short answer) formats.

The purpose of this study was to examine the effects of inserted question type, response mode, and criterion test format on children's comprehension of expository text. Four hypotheses were proposed: (1) students performance on the TE, TI, or SI questions on the criterion test will vary as a function of the type of inserted question received, (2) students responding overtly to the inserted questions will perform at a higher level on the criterion test than those responding in a covert manner, (3) performance levels would be higher on the recognition than the recall test, and (4) that across developmental or age levels, patterns of performance will remain constant.

Method

Subjects

Students from neighboring elementary and middle schools participated in the study: 97 fourth and 102 eighth grade students. All students were drawn from a middle class suburban area and read at or above grade level, as measured by reading group placement.

Materials

The passage selected for use in this study was a 600-word expository passage written on the fourth grade level, the topic (dogs) was familiar as indicated by pilot data. Two sets of eighteen questions were developed for the passage: one inserted question set and one post-reading comprehension set, with six each TE, TI, and SI questions in a set. For the post-reading comprehension questions, two versions were created. One version involved only the question stems to which the students would provide short answer responses. The other version involved the same stems followed by four alternative choices, of which only one was correct.

These materials were combined to form the student test booklets which took the following form: the passage was divided into six equivalent sections, with one inserted question following each section. The question referred to information presented in the preceding section. A post-reading comprehension test followed the six sections. The test consisted of six each TE, TI, and SI questions in either the short answer or the multiple choice format. Each booklet was designated a TE, TI, or SI booklet based upon the type of inserted question it contained; that is, each booklet contained only one type of QAR as inserted questions, while all three question-answer relationships were repre-

sented in the comprehension test.

Design and Procedure

A 3 X 2 X 2 X 2 mixed factorial design was created with the between-subjects factors of inserted question type (TE, TI, and SI), response mode (Overt and Covert), test mode (Recall and Recognition), and grade level (Fourth and Eighth), and the within-subjects factor of test question type (TE, TI, and SI). Students were divided randomly among conditions such that the number per cell ranged from 7 to 9.

Students were tested within classrooms, taking approximately forty-five minutes to complete the task. Students were randomly assigned to test booklets which consisted of the passage with its inserted questions and the comprehension test following the passage. All students were told that the purpose of the study was to discover ways to help them better understand stories and assignments they had to read in school. They were also given a brief introduction to the three QARs, designed to reduce the level of anxiety that students in the SI condition might have experienced when they were unable to locate response information.

Following the introduction into QARs, students were instructed to read each section of the passage, respond to the question on the page following each section without referring back to the text, proceding through the booklet in this manner until they had completed all six sections with their corresponding questions. Students in the overt condition were instructed to write the answer on the blank following the inserted question; students in the covert condition were instructed to think carefully and as hard as they could of the response to the question. When their reading was completed, they were directed to the comprehension test, instructed to answer the eighteen questions without

reference to the passage. Students either completed the short answer or the multiple choice version. When the class had finished, a debriefing was provided, explaining the study more completely, including the variations among the booklets.

Scoring Procedures

Two scoring procedures were developed: a traditional correct-incorrect dichotomous scale was used for the multiple choice test and a four-point scale was used for the short answer test. The four-point scale rated responses as (1) an exact or close synonym for the expected response, (2) a borderline response (one that would be correct only in the most lenient of circumstances), (3) an incorrect response, and (4) a response that was undecipherable due to writing or spelling or one that had been left blank. Only answers from the first category were accepted as correct in the analysis. Interrater reliability across four raters reached .94. Any disagreements were resolved following a discussion among the judges.

Results

A 3 X 2 X 2 X 2 mixed analysis of variance assessing the number of correct responses on the criterion tests revealed significant main effects for grade level, $F(1,175) = 50.99$, $p < .01$; test mode, $F(1,175) = 117.56$, $p < .01$; and test question type, $F(2,350) = 15.38$, $p < .01$ (see Table 1).

Insert Table 1 About Here

These results were further explained by three significant two-way interactions. Test mode interacted with grade, $F(1,175) = 12.33$; $p <$

.01, the interaction due to the magnitude of the difference in performance of the fourth grade students across the two test modes relative to that of the eighth grade students (see Figure 1).

Insert Figure 1 About Here

Test mode also interacted significantly with test question type, $F(2,350) = 16.66$, $p < .01$. Students in the recognition test mode seemed equally facile on TE, TI, and SI questions, while students in the recall test mode were most successful on the TI questions, less so on the SI and TE (see Figure 2).

Insert Figure 2 About Here

The third significant interaction was response mode X grade, $F(1,175) = 10.59$; $p < .01$. Students in the eighth grade performed as predicted; those in the overt response condition were more successful than those in the covert. However, contrary to predictions and expectations based upon adult data, the reverse was true for the fourth grade students (see Figure 3).

Insert Figure 3 About Here

Discussion

Four predictions had been proposed at the onset of the study and the results will be discussed in terms of these hypotheses. Recall that the first prediction suggested that students' performance would be higher

on a specific question type depending upon the type of question received during reading. That is, an inserted question type by test question type interaction was expected. That this did not occur may be a function of the type of posttest. Since the criterion test assessed the indirect effect of inserted questions, performance on non-target or incidental information, the lack of an interaction may be explained in terms of the novelty of the information required for an accurate response. In fact, Reynolds & Magleby (1981) using the same passage but testing for the direct effect on target information did find this interaction.

The second hypothesis suggested that performance levels when required to provide an overt response to the inserted questions would be higher than those required to provide a covert response, as suggested by the adult data. This is perhaps one of the most interesting findings of the study, because 4th and 8th grade students respond differentially to the overt task requirements. The eighth grade students' performance was similar to that found with adult populations, suggesting that for the older students the overt response induced some greater level of processing of information, focused attention on target information, or ensured the required activity on the part of the subjects, such that their performance was enhanced. However, for the fourth grade students, this effect did not occur, and in fact the overt response inhibited their performance. One explanation could be due to fine motor skill differences; students at this level are less facile in their writing and spelling skills, thus to respond overtly redirected their attention to less relevant issues. Another explanation may be one of cognitive capacity. Perhaps being required to write the explanation as well as hold

information from the text puts too great a demand on their cognitive capacity, thus performance which reflects their comprehension of the material suffers. By the time the response is decided upon and recorded, the overall ideas in the text are lost.

The third hypothesis was that performance would be higher on recognition than recall tasks. This is precisely what was found, though at the fourth grade level this difference was more pronounced than for the eighth grade students.

Finally, it was hypothesized that patterns would remain constant across the two developmental levels. That this did not occur suggests the need for further research in the area of adjunct questions. It appears that not only are children different from adults, but that one can not generalize from one population of students to another. This could be a reason for the equivocal results of the research thus far (e.g., Rickards & Denner, 1979; Swenson & Kulhavey, 1974; Rickards & Hatcher, 1978) which suggest that the effect of inserted questions is inconsistent. The fact that all students in this study were reading at or above grade level may also have masked effects of inserted questions in that it is assumed that students who are successful readers are already organizing and retaining the information presented to them in texts.

Limitations of the Study

There are several limitations to this study which reduce its generalizability and suggest directions for future research. One obvious path for extension of this work lies in assessing these variables across a number of passages. While pilot work and our on-going research tends to support these findings, a thorough investigation of factors that

influence comprehension across passages which vary in familiarity and difficulty should be considered. Further studies incorporating reading ability and age levels should be conducted. In addition, as question taxonomies are developed which accurately reflect both levels of processing and the relationship between question, text, and reader's knowledge base; these taxonomies should be applied to inserted question research. Finally, since research tends to differ in the effectiveness of the inserted question, further research should be conducted comparing these variables as they affect performance relative to performance of students in a no-question control group.

References

Anderson, R. C. Educational Psychology. Annual Review of Psychology, 1967, 18, 129-164.

Anderson, R. C., & Biddle, W. B. On asking people questions about what they do when they are reading. In G. Bower (Ed.), Psychology of learning and motivation (Vol. 9). New York: Academic Press, Inc., 1975.

Anderson, R. C., & Myro, D. L. Retroactive inhibition of meaningful discourse. Journal of Educational Psychology Monographs, 1971, 9, 385-390.

Carrier, C. A., & Fautsch-Patridge, T. Level of questions: A framework for the exploration of processing activities. Contempory Educational Psychology, 1981, 67, 380-384.

Felker, D. B., & Dapra, R. A. Effects of question type and question placement on problem-solving ability from prose material. Journal of Educational Psychology, 1975, 67, 380-384.

Frase, L. T. Some unpredicted effects of different questions upon learning from connected discourse. Journal of Educational Psychology, 1968, 59, 197-201.

Frase, L. T. Structural analysis of the knowledge that results from thinking about text. Journal of Educational Psychology Monograph, 1969, 60, (6, Pt. 2).

Frase, L. T. Influence of sentence order and amount of higher order text processing upon reproductive and productive memory. American Educational Research Journal, 1970, 1, 307-319.

Frase, L. T. Effect of incentive variables and type of adjunct question upon text learning. Journal of Educational Psychology, 1971, 62, 371-375.

Friedman, F., & Rickards, J. P. Effect of level, review, and sequence of inserted questions on text processing. Journal of Educational Psychology, 1981, 73, 427-436.

Holland, J. G., & Kemp, F. D. A measure of programming in teaching-machine material. Journal of Educational Psychology, 1965, 56, 264-269.

Kemp, F. D., & Holland, J. G. Blackout ratio and overt responses in programmed instruction: Resolution of disparate results. Journal of Educational Psychology, 1966, 57, 109-114.

Mayer, R. E. Forward transfer of different reading strategies evoked by test-like events in mathematics text. Journal of Educational Psychology, 1975, 67, 165-169.

McConkie, G. W., Raynor, K., & Wilson, S. J. Experimental manipulations of reading strategies. Journal of Educational Psychology, 1973, 65, 1-8.

Pearson, P. D., & Johnson, D. D. Teaching reading comprehension, New York: Holt, Rinehart, & Winston, 1978.

Reynolds, R. E., & Magleby, L. Developmental effects of question type and question position on children's learning of prose material. Paper presented at the National Reading Conference, Dallas, December, 1981.

Rickards, J. P. Interaction of position and conceptual level of adjunct questions on immediate and delayed retention of text. Journal of Educational Psychology, 1974, 66, 354-362.

Rickards, J. P., & Denner, P. R. Inserted questions as aids to reading text. Instructional Science, 1978, 7, 313-346.

Rickards, J. P., & Denner, P. R. Depressive effects of underlining and adjunct questions on children's recall of text. Instructional Science, 1979, 8, 81-90.

Rickards, J. P., & DiVesta, F. J. Type and frequency of questions in processing textual material. Journal of Educational Psychology, 1974, 66, 354-362.

Rickards, J. P., & Hatcher, C. W. Interspersed meaningful learning questions as semantic cues for poor comprehenders. Reading Research Quarterly, 1978, 13, 539-553.

Rothkopf, E. Z. The concept of mathemagenic activities. Review of Educational Research, 1970, 40, 325-335.

Sanders, J. R. Retention effects of adjunct questions in written and aural discourse. Journal of Educational Pscyhology, 1973, 65, 181-186.

Shavelson, R. J., Berliner, D. C., Ravitch, M. M., & Loeding, D. Effects of position and type of question on learning from prose material: interaction of treatments with individual differences. Journal of Educational Psychology, 1974, 66, 40-48.

Swenson, I., & Kulhavy, R. W. Adjunct questions and the comprehension of prose by children. Journal of Educational Psychology, 1974, 66, 212-215.

Watts, G., & Anderson, R. C. Effects of three types of inserted questions

on learning from prose. Journal of Educational Psychology, 1971, 62, 387-394.

Table 1

Main Effects

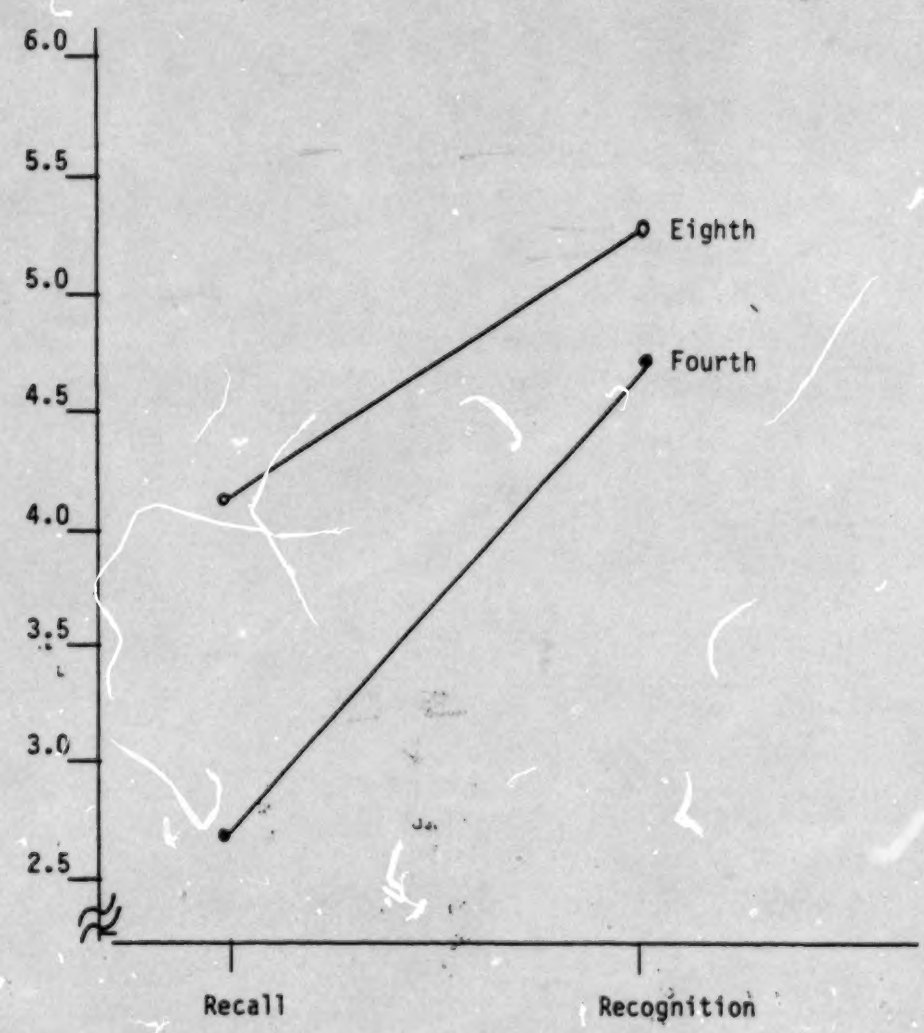
Grade	
Fourth	3.66
Eighth	4.71
Test Mode	
Recall	3.38
Recognition	4.82
Question Type: Test	
TE	4.34
TI	4.27
SI	3.89

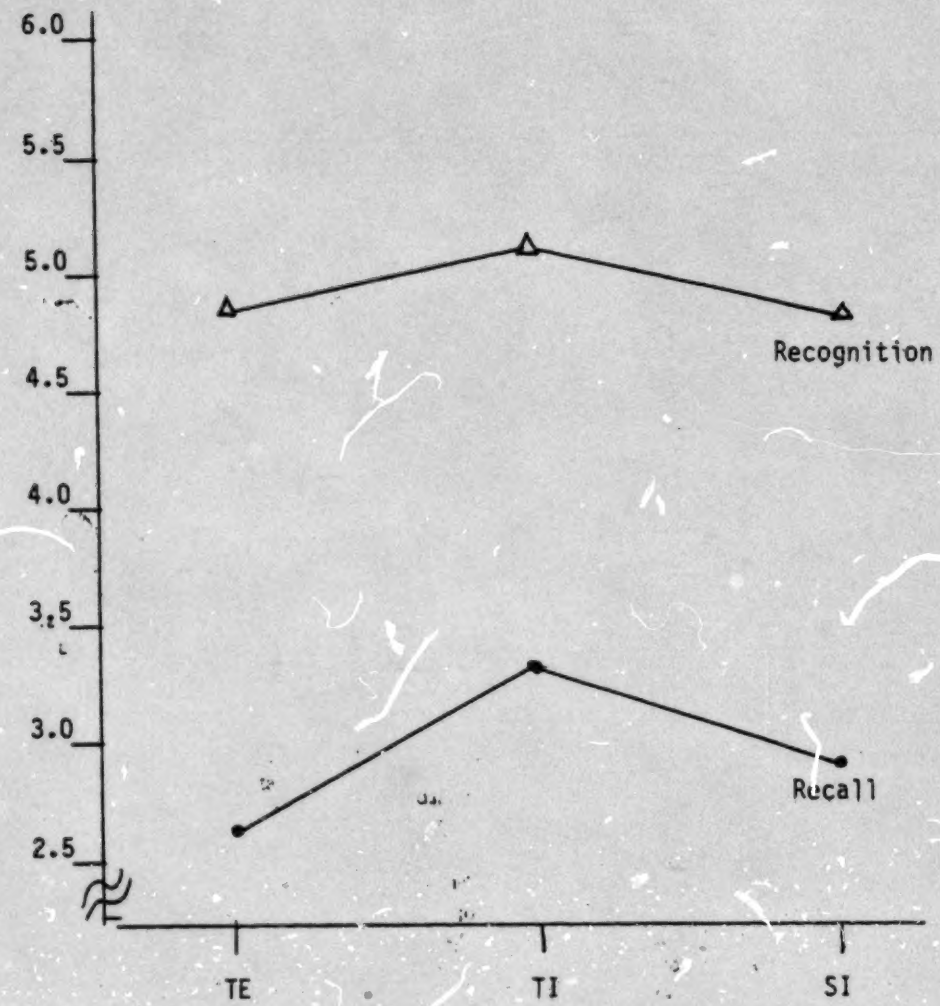
List of Figures

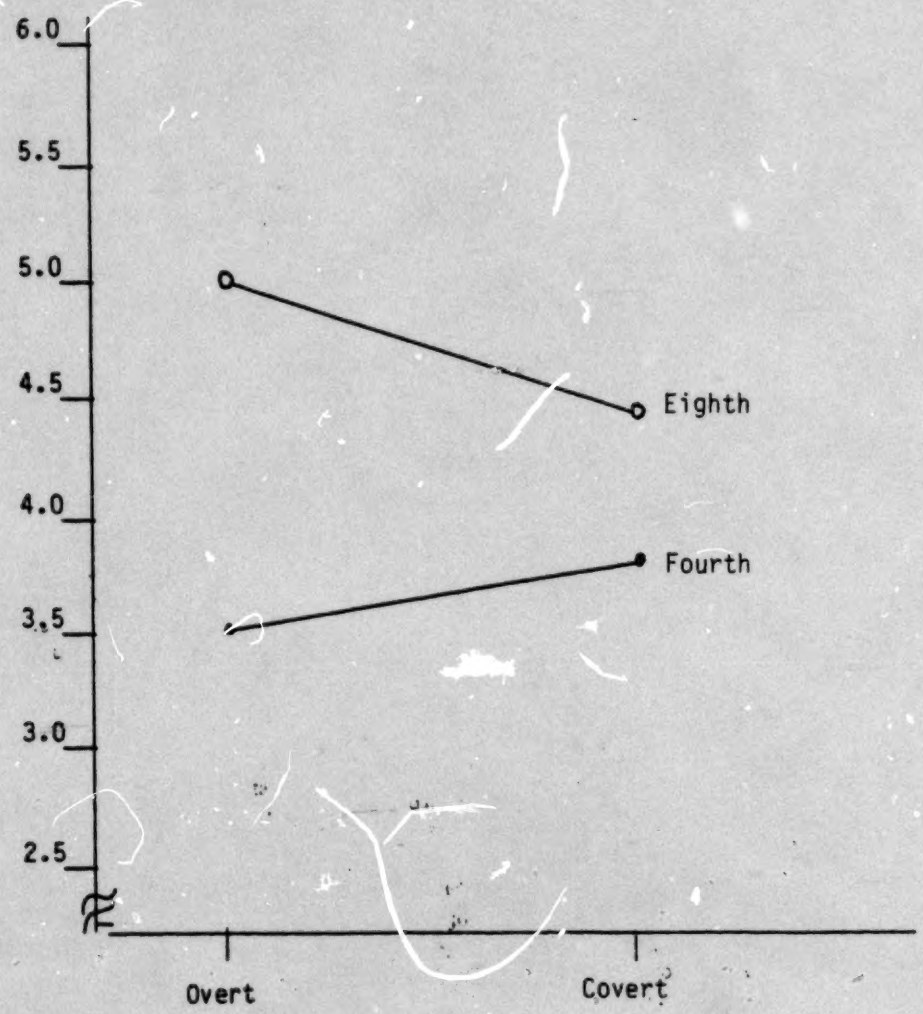
Figure 1. Grade X Text Mode Interaction

Figure 2. Text Question QAR X Test Mode Interaction

Figure 3. Grade X Condition Interaction


6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
Eighth
Fourth
Recall
Recognition


6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
Recognition
Recall
TE
TI
SI


6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
Eighth
Fourth
Overt
Covert